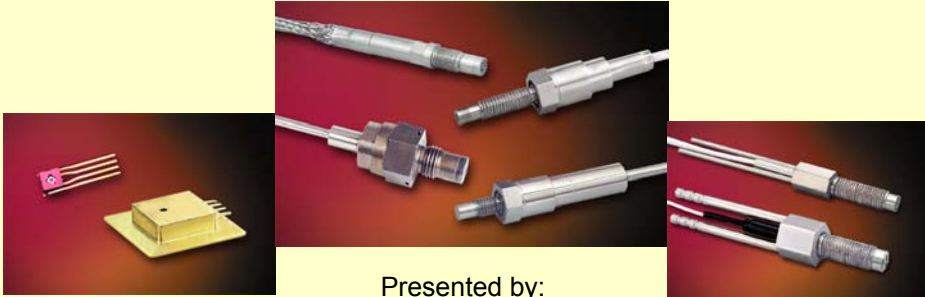




## Improved SiC Leadless Pressure Sensors For High Temperature, Low and High Pressure Applications

Alexander A. Ned, Anthony D. Kurtz, Glenn Beheim,  
Fawzia Masheeb, and Sorin Stefanescu



Presented by:  
Alexander A. Ned

Kulite Semiconductor Products, Inc.  
Presented at the 21<sup>st</sup> Transducer Workshop  
Lexington Park, MD June 22-23, 2004



## Sensing Requirements

- High Temperatures
- High Vibration
- Typically 25 psi Up To Few Thousand psi
- Static and Dynamic

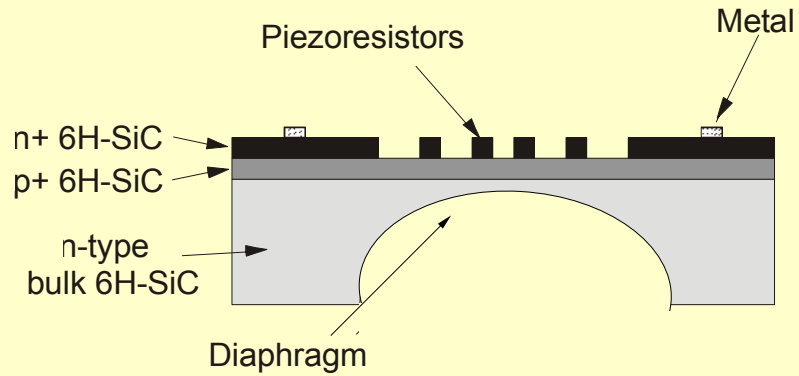
## SiC Piezoresistive Sensors

- Expected To Replace Si For  $T > 700^{\circ}\text{C}$
- All SiC Design
- Leadless Packaging Approach

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## SiC Sensor

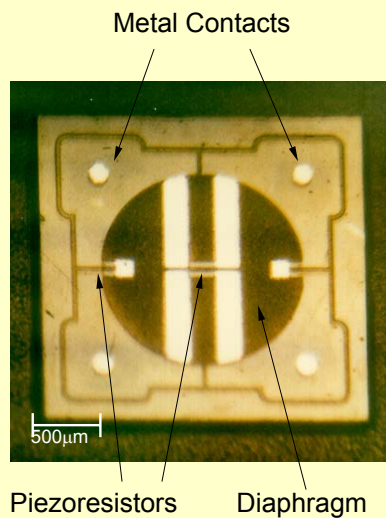


### Cross-Sectional View of SiC Sensor

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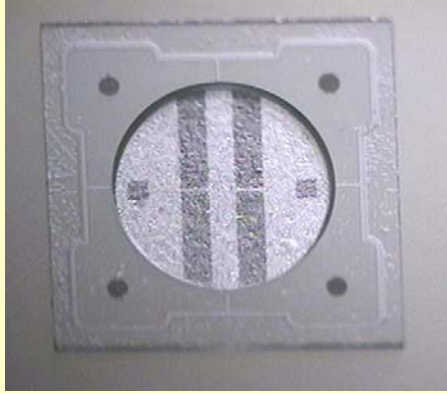
## Leadless SiC Sensor Chip



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## Micromachined Diaphragm in SiC Sensor Chip

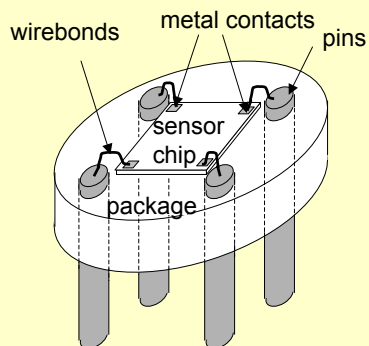


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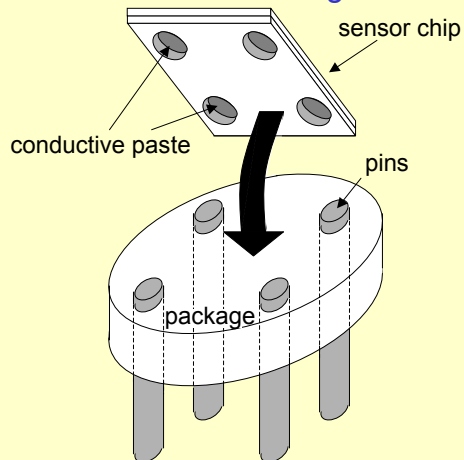


## Leadless vs. Wirebonded Packaging Methods

-with wirebonding



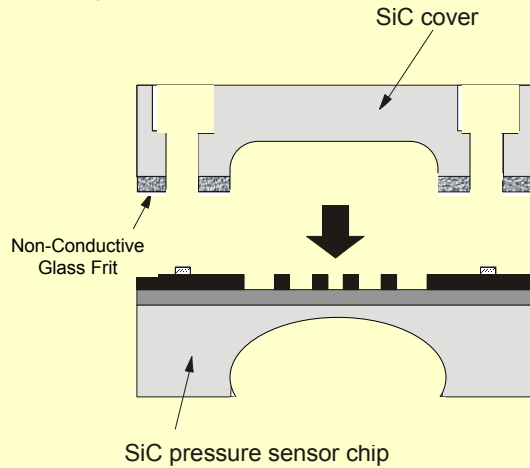
-without wirebonding: leadless



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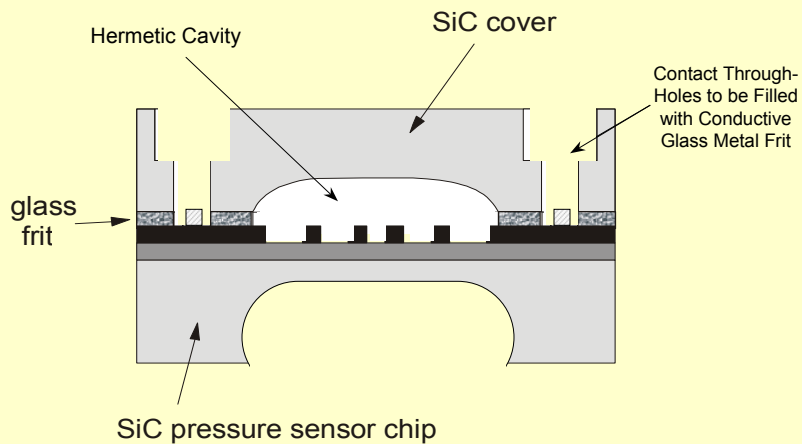
## Sensor Cover Attached to the Sensor Chip Using High Temperature Glass Frit



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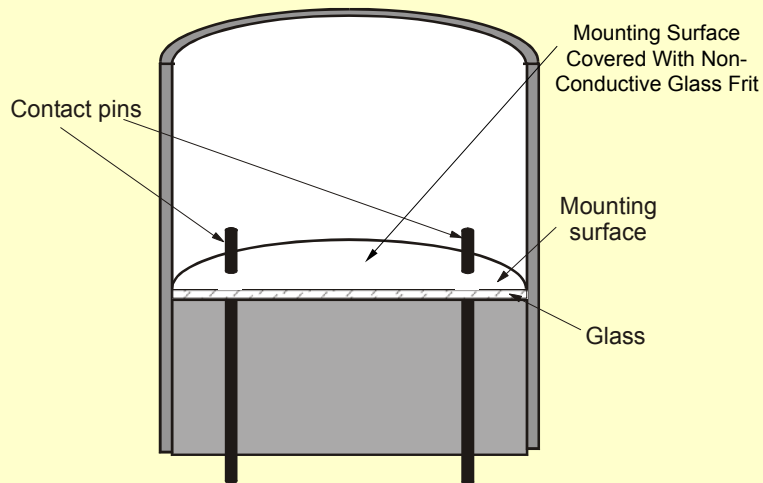
## Schematic Cross-Sectional View of the Composite Sensor-Cover Chip



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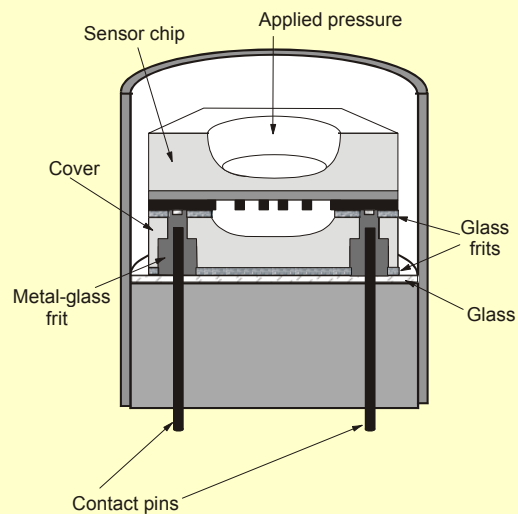
## Schematic Drawing of the Sensor Header



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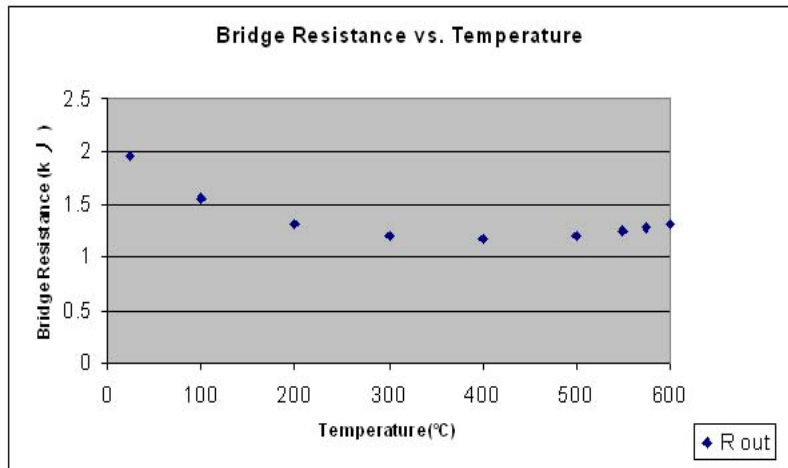
## Schematic Drawing of the Packaged Sensor Structure



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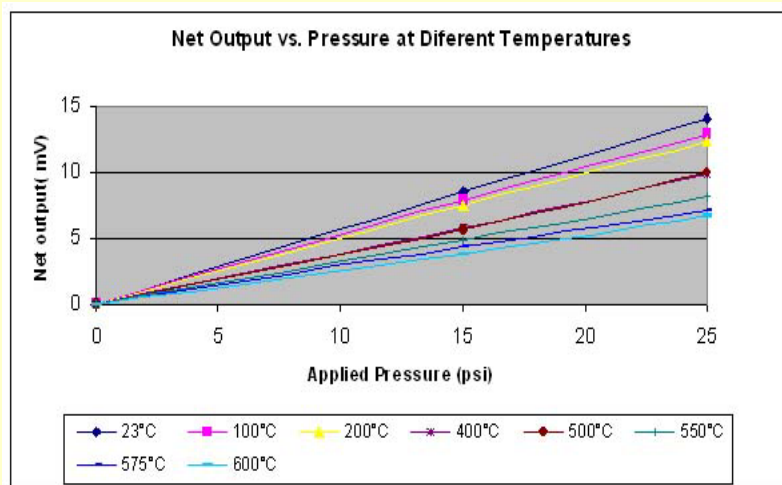
## Leadless SiC Sensor



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## Leadless SiC Sensor



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## Summary

- SiC vs. Si
- Low and High Pressure SiC Sensors Fabricated and Packaged
- 25-1000 psi Sensor Performance up to 600°C Demonstrated
- Sensor Performance Consistent With Previously Reported Data
- Low Pressure Sensing – Thin SiC Diaphragm
  - Finite Element Analysis
- Sensor Optimization
  - Leadless SiC Sensor Chip
  - Leadless Assembly

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